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ABSTRACT

Good thinking can be placed within a descriptive framework which includes a state of doubt about what to do or believe; goal, possibilities, and evidence seeking; and evidence use. The framework is useful in describing all types of thinking, although the search process may differ in the degree of control the thinker has over his search. Examples of different types of thinking include diagnosis, hypothesis testing, reflection, insight problems, creation, prediction, decision making and planning, behavioral learning, and learning from observation. In all thinking the search process should involve the two basic principles of carrying out the search process to an optimal extent and using evidence fairly. With both principles, bias can occur in favor of too little thinking and insufficient self-criticism. Therefore the teaching of good thinking which would eliminate biases involves not only the teaching of skills, methods, facts, and habits, but also the inculcation of beliefs and goals. Ultimately, the teaching of thinking is a value-laden activity. (BL)

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WHAT IS GOOD THINKING?

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What is good thinking?

Jonathan Baron, University of Pennsylvania

We may be seeing a resurgence of a liberal tradition in psychology and education, a tradition committed to the idea that people can develop the intellectual power to solve their own problems, individual and collective, without the need to rely on authority or blind adherence to tradition. One manifestation of this resurgence is an increase in the number of attempts to make students more intelligent by teaching them to think well. My goal here is to sketch a theory (that of Baron, in press) of good thinking, a theory that can serve as a guide for such educational efforts and for their evaluation. First, I shall present a descriptive framework that applies to all goal directed thinking, including problem solving, diagnostic, scientific, and moral reasoning, prediction, planning, creative work, and learning. I analyse all these kinds of thinking into the search for possibilities, evidence, and goals, and the use of evidence to strengthen or weaken possibilities. Second, I argue that two main types of biases are likely to occur. The first is insufficient search for possibilities, evidence, and goals - that is, thinking that ends too early, or doesn't happen at all when it should. The second is a set of biases in which we search for and use evidence so as to favor possibilities that are already strong; these have been called "confirmation bias" (Mynatt et al., 1978). It order to say that a bias is truly present, we need to be clear about how thinking should proceed. Without a clear prescriptive theory of thinking, it is impossible to resolve arguments about whether a given thinker shows a bias or whether he is merely thinking in a way that is adaptive for him in most situations. Third, I discuss some implications of the theory for educational efforts to improve thinking. I suggest that the beliefs and goals associated with good thinking might be an important component of any program to improve thinking.

The development of a theory of good thinking is an unusual sort of enterprise. First, it is largely a philosophical enterprise. We cannot do an experiment to tell us what good thinking is, because experiments only tell us (at best) what is likely to be true or false. At issue are standards, not facts. What we can do is to reflect on our own standards and try to refine them by criticizing them.

On the other hand, we want a practical theory. We want to use it to tell people how to conduct their thinking well, not just to classify their thinking as good or bad once it has occurred. Many theories of good thinking (or creativity, or other desirable traits) are like a theory of good investing that says, "A good investor is one who buys low and sells high." Indeed, but how do we do it? Thus, it is insufficient to say that good thinking is thinking that "finds the essence" or discovers "appropriate" analogies. These are just various ways of saying that good thinking is what gives us the right answer.

The question of generality comes up in any discussion of teaching thinking, and I had best deal with it right away. It is apparent that many people are good thinkers in some areas, such as their work, but not in others, such as their personal lives or their finances. If this appearance is true, should it obviate the need for a general theory of good thinking? I think not. First, we might be able to teach good thinking across many domains even if there are now very few people who are good thinkers in more than a few. Second, even if we decide against such general instruction, we can still use a set of standards

for the teaching of thinking in particular domains. The theory under discussion suggests that there is much in common among good thinking in the arts, the sciences, and the conduct of life. Thus, a single theory of good thinking might help us to teach good thinking in each domain where we expect it to be used, even if we have to do this one domain at a time.

The description of thinking

Consider an executive caught in a dilemma: how should she respond to her colleagues' unanimous decision to increase their expense accounts without informing the central office (which is unlikely to notice)? First, she wants to go along, imagining the nice restaurants she could take her clients to, but then she wonders whether it is right to do so, from the corporation's point of view. She is still tempted to go along, for it has been argued that other departments in the corporation are allowed higher accounts, and that increased entertainment and travel opportunities will benefit the corporation in various ways. However, she thinks of reasons against this view, such as the argument that any other department could do the same, on the basis of other flimsy excuses, and if all did so, the corporation would suffer considerably. (She makes use here of a heuristic or schema for moral arguments that she recognizes as one she has used before.) She considers reporting the decision to the central office, but rejects this both because of the personal danger it would involve and her feelings of loyalty to her colleagues. She decides not to go along, and to keep careful records of her own actual use of her expense account, because she has imagined what would happen if the scheme were in fact discovered.

This episode of thinking has much in common with other thinking: It begins with a state of doubt about what to do or what to believe (Dewey, 1933). Goals are present or sought, possibilities are sought to achieve the goals, and evidence is sought to strengthen or weaken the possibilities.

A goal is a criterion for ending the thinking process. It is reached when I find an acceptable answer to a question, such as, "What should I do?" For our executive, her initial goals are to serve her own interests in food and travel; later, she adds the goals of concern with her immediate colleagues and concern about the corporation. The goal determines what evidence is sought and how it is used. For example, it is not until moral goals are adopted that the "what if everybody did that" schema is used to search for evidence.

Possibilities are possible answers to the question implicit in the goal, e.g., possible actions our executive might take. Possibilities (like goals and evidence) may be in mind before thinking begins, or they may be added as a result of search or suggestion from outside. Each possibility has a strength, which represents the extent to which it is seen by the thinker as satisfying the criteria that constitute the goal, given her knowledge, beliefs, and abilities. Strength is thus a function of the possibility and the goal, the function itself depending on the thinker, given his knowledge and abilities. When the goal of thinking is to determine the truth (as in diagnosis, or in detective work), strengths may be interpreted as probabilities. In decision making, strengths correspond to utilities (Baron, in press), roughly, measures of value, taking into account all relevant goals. In such cases, we might sometimes imagine that a possibility is evaluated on several dimensions, each corresponding to a goal, and the overall strength of the possibility is some sort of combination of these separate evaluations. For example, our executive might feel that the possibility of informing the central

office is high on the dimension concerning the corporate interest but low on the dimensions concerning herself and her colleagues, hence low overall. Her chosen solution to her problem was moderate on all relevant dimensions but high on none. These dimensional strengths can be used to guide the search for new possibilities, e.g., our executive might consider trying to persuade her colleagues to inform the central office, thus ameliorating the deficiencies of her chosen possibility. We may define confidence as a measure of the closeness of thinking to its goal; often, confidence is simply the maximum of the strengths of the possibilities under consideration.

Evidence is sought - or (like the arguments of the colleagues) makes itself available. The evidence may consist of arguments, imagined scenarios, examples, etc. One possibility can serve as evidence against another, as when we challenge a scientific hypothesis by giving an alternative and incompatible explanation of the data. Evidence is defined by its function, which is to increase or decrease the strengths of the possibilities, as when the moral argument weakens the possibility of going along. For this purpose, each piece of evidence has a weight with respect to a given possibility and goal. This weight depends on the thinker's knowledge and beliefs. A weight by itself does not determine how much the strength of a possibility is revised; rather, the thinking controls this revision. Thus - as I shall discuss - a thinker may err by revising a possibility too much or too little.

The basic idea of the descriptive framework, then, is to analyse thinking into phases or functions. This analysis provides a way of categorizing the moves a thinker makes in the course of thinking. A given move may be a member of two categories, as it may have two functions. A given phase in an episode of thinking may contain other episodes of thinking, which may contain others, and so on. For example, the phase of gathering evidence might require thinking about what evidence to gather or how best to gather it.

I shall say that the phases are conscious in the sense that a thinker can be assumed to be able to follow instructions stated in terms of the phases, and to recognize whether he has succeeded in doing so. Thus, the descriptive language of these phases can be used both to instruct a person in thinking and to analyse his reports of his thinking. Some phases may be missing from some episodes of thinking, in the sense that their work is done subconsciously, that is, without such a potential for instruction and recognition. When all phases occur subconsciously, no thinking has occurred (in the sense in which I use these terms), but the work of thinking has been done by subconscious processes. For example, when I swerve to avoid a pot-hole while driving, I are not aware of any evaluation of alternative possible actions, and it is immaterial here whether I say that such evaluation occurred subconsciously or not at all. I concentrate on conscious thinking, in the sense I defined, because this is what can be influenced by advice about rationality, in such a way that the thinker can cooperate in such an educational enterprise by observing his own thinking. Extension of the theory to unconscious thinking might be possible, but it is beyond the scope of the present inquiry.

Why just the phases I have listed: search for possibilities, evidence, and goals, and use of evidence? The idea is that thinking is, in its most general sense, a method of choosing among potential possibilities, that is, possible beliefs or actions. For any choice, there must be a purpose or goal, and the goal is subject to change. I can search for (or be open to) new goals; hence, search for goals is always possible. There must also be objects that can be brought to bear on the choice among possibilities; hence, there must be

evidence, and it can always be sought. Finally, the evidence must be used, or it might as well not have been gathered. The phases I have outlined are necessary in this sense.

Types of thinking

The framework just sketched is useful in describing all types of thinking. It thus calls attention to what different kinds of thinking have in common. However, it also points to some differences. Most importantly, each search process may be considered as a request for objects (possibilities, evidence, or goals), and thinking tasks may differ in the degree of control the thinker has over this search. In some cases, the success or failure of the search may be largely independent of the effort allocated to it; in other cases, the phase may operate so quickly that it is even insensitive to the amount of time allowed for it to occur by itself. Further, each request for objects specifies certain of their properties, and in some cases, some of these properties in the request may have no effect on the result. Here are some examples of types of thinking, chosen to illustrate both the flexibility of the scheme and the differences it reveals.

Diagnosis. In diagnosis - including medical diagnosis and troubleshooting of all sorts - search for possibilities (diseases, sources of malfunction) is under considerable control. Search for evidence is only partially under control, both because some of the evidence is provided without being requested, and because there is some limitation on the kinds of requests that can be obeyed. In particular, the import of the evidence cannot usually be specified as part of the request (e.g., "give me any evidence supporting a diagnosis of ulcers" - unless the patient knows what this would be!). In the purest form of diagnosis, the goal is essentially never changed, although there may be sub-episodes of thinking directed toward subgoals such as obtaining a certain kind of evidence.

Hypothesis testing. A great deal of science involves testing hypotheses about the nature of some phenomenon, such as the spread of a disease, typically by seeking evidence from experiments or observations. Science differs from diagnosis in that the search for goals is largely under control and goals are frequently changed. Scientists (at least those I know) frequently "discover" the "real question" they were trying to answer in the course of trying to answer some other question. There is - in experimental science - the same limitation on control over the evidence-search phase; the scientist cannot pose a question of the form, "Give me a result that supports my hypothesis." This limitation does not apply when evidence is sought from the literature or from one's memory.

Reflection. Reflection includes the essential work of linguists, philosophers, and others who try to arrive at general principles or rules on the basis of evidence gathered largely from their own memories rather than from the outside world. In reflection, the search for evidence is more controllable than in diagnosis and experimental science; in particular, a thinker may direct his memory to provide evidence either for or against a given possibility (in this case, a generalization). In reflection (and to some extent elsewhere) new possibilities are often modifications of old ones.

Insight problems. These are problems whose solution usually comes suddenly and with some certainty. Many are used on intelligence tests, e.g., Raven's Matrices. Essentially, the only phase under control at all is the

search for possibilities. Often, it is difficult to come up with any possibilities at all. In other cases, possibilities present themselves readily and are rejected even more readily. In either case, search for evidence and use of evidence (acceptance or rejection) are essentially immediate, and the goal is fixed by the problem statement. It is this immediate, effortless occurrence of the other phases that gives insight problems their unique quality of sudden realization of the solution.

Creation. We refer here specifically to artistic creation, although, of course, many other thinking tasks are similar to artistic creation in many respects (Perkins, 1981). In creation, possibilities are possible parts of the work, e.g., possible words or phrases in a poem. Evidence consists largely of these parts themselves. The weight of the evidence is essentially the artist's critical reaction to the evidence itself (see Perkins, 1981, ch. 4). A negative reaction indicates a kind of discrepancy between the possibility and the goal, and in creation, it can be responded to by searching for new possibilities and goals (including modifications of old possibilities and goals). Creative tasks are almost unique in the extent to which the search for goals is under control; indeed, part of out concept of creativity may include the idea of pursuing novel goals (or novel variations of traditional goals). The artist examines a particular possibility with the (partial) purpose of elaborating (generating an additional part of) the goal, which can guide the search for the next possibility (often a modification of an earlier one).

The possibilities are also often hierarchically arranged. For example, we can think of an entire work of art (or even a career plan) as a possibility, or a part of that work, or a part of that part, e.g., a line or word in a poem. Each kind of part may be the object of thinking, and the choice of that part usually affects the evaluation of (assignment of strengths to) higher- and lower-level parts. This hierarchy of parts leads to a hierarchy of goals and subgoals, and a corresponding hierarchy of episodes and sub-episodes of thinking.

The tasks discussed so far, in their stereotypic forms, require thinking almost by definition. In the remaining tasks I discuss, the stereotypic forms do not require thinking, although thinking may be done. Thus, in these tasks, possibilities may be adopted without even any period of openness to other possibilities, evidence, or new goals. Although insufficient search (as defined later) may occur in all tasks, in the tasks to follow, bias often takes the form of total absence of thinking in cases in which thinking would truly be worthwhile.

Prediction. Prediction of likely future events is like reflection in form, although the search for goals may not be as controllable. The evidence often consists of memories of other situations the thinker knows about, which are used as the basis of analogies.

Decision making and planning. Here the possibilities are courses of action, and the evidence, usually from memory, may consist of imagined consequences, based on analogies. Sub-episodes of prediction may be required in the evidence-search phase. That is, in imagining consequences, one may have to try to predict them. All phases are under control.

An interesting sub-class of planning and decision making is the selection of strategies (rules for performance) for other mental tasks, including other thinking tasks. The use of thinking to decide on a strategy for another task

may be a form of "executive control" over strategies in the literature on memory and learning (e.g., Campione, Brown, & Ferrara, 1982). Lack of executive control may amount to never having thought about how to do a task.

Behavioral learning. I use this to mean "learning about the effects of one's own behavior." This is one of the most important kinds of learning. In every realm of our lives, in social relationships, work, etc., we learn how to control events through our behavior. Much of what constitutes our personality may be seen as a set of learned patterns, often ones that have become habitual. The success and failure of our plans depends in large part on the effectiveness of this kind of learning. When thinking occurs as part of such learning, each action is a search for evidence (the outcome of the action), and each possibility is a policy concerning what action to take in some class of situations.

As pointed out by Schwartz (1982), this kind of learning can have much in common with science. Each action in a particular environment can be an experiment designed to find out what happens as a result of taking that action in that environment. However, where science is a pure activity, with a single goal, behavioral learning has two goals: learning about the situation, and obtaining immediate success or reward in the task at hand. These goals often compete. We are often faced with a choice of repeating some action that has served us reasonably well in the past, or taking some new action either in hopes that it might yield an even better outcome or in hopes of obtaining evidence that will help us decide what to do in the future. Many people probably choose the former course too often, and, as a result, achieve adaptations less satisfactory to them than what they might achieve if they experimented more.

One example of behavioral learning is the learning of heuristics and strategies for thinking tasks themselves. The effectiveness of thinking may depend largely on the number and quality of these heuristics and strategies. This, in turn, may (or may not) depend on the quality of the thinking that went into the learning of those heurisrics. If thinking can be brought to bear on the learning of heuristics, it can be an extremely powerful determinant of intellectual growth (Lenat, 1983). (Note that the crucial question, for education, is "can be" rather than "is".)

Learning from observation. This includes all cases in which we learn about our environment from observation alone, without voluntary experimentation (e.g., the "reception" paradigm in Bruner et al., 1957, as opposed to the "selection" paradigm). As such, it can include behavioral learning without experimentation, namely, learning in which we simply observe that certain actions (done for reasons other than to get evidence) are followed by certain events. It may also include a large part of the learning of language, including word meanings, and other culturally transmitted bodies of knowledge. Clearly, the distinctive property of learning by observation is that the evidence is not under control at all.

The prescriptive theory

Now that I have said what I take thinking to be, and how it can be analysed, it is time to say what good thinking is. There are two basic principles. First, each of the three search processes, search for possibilities, evidence, and goals, should be carried out to an optimal extent. Second, evidence should be sought and used in a way that is fair to all possibilities under consideration, whether they are strong or weak at the

moment. I shall argue that these principles are generally violated in the direction of too little search rather than too much, and bias that favors strong possibilities rather than weak ones.

What does it mean for a search process to be carried out to an optimal extent? How is the optimum to be determined? First, we want our prescription to be useful to a thinker, so we can use only what is available to the thinker. We cannot take the point of view of an omniscient observer who knows whether a student will solve a calculus problem with another 15 minutes work or whether the problem is utterly beyond the student's reach. We must accept the thinker's own categorization of the problem, and his own expectations about his ability in problems within that category. (This does not stop us from questionning those expectations, which may themselves be formed by good or poor thinking, but then we are criticizing thinking about one's abilities rather than about the problem at hand.)

When I say that there is too little search (or too much) I mean that more search (or less) would increase some sort of net benefit, taking into account both the costs and expected benefits of search. Search should stop just when it becomes counterproductive, when the costs of thinking (in effort or lost opportunities) become greater than the benefits to be expected. But what sort of benefits and costs? Here, I assume that there is some way of combining different kinds of values to arrive at an overall estimate of expected net benefit or <u>utility</u> of thinking. One way to think about this (Baron, in press, Chapter 2) is that the utilities are determined by the long-term plan that the thinker would choose for himself on reflection. Typically, a long-term plan would include things like career plans, hobbies and interests, plans and expectations concerning the management of one's own affairs, interpersonal relationships, and social, religious, and political activities. Thinking would be more relevant to some of these things than others. A plan might also specify a way of thinking about one's life in terms of separate realms (work, home, church, etc.) that might not interact with each other all that much. Once we specified that some task we were doing was relevant only to our work, it becomes easier to think about the value of thinking in that task (than if we had to consider its relevance to all our other activities). Note that the thinker's long-term plan could take into account what we might call moral utilities, that is, the value of his thinking for other people; for example, a person studying to be a physician, when deciding whether to study more or to try to understand something more deeply, might take into acount the effect of her understanding on her patients as well as on her own tangible success. ("I know enough to pass the test, but I'd better really understand this stuff, because a patient's life might depend on it.")

Further, we might also want to take the perspective of the educator rather than the thinker himself (Baron, in press, Chapter 2). The educator is concerned not only with each student's individual welfare but also with the contribution of that student to society or to the welfare of others. From the educator's perspective, the long-term plan that a student would choose on reflection is one that took fully into account the obligations to be a good citizen and a contributing member of society.

For practical purposes, in school, it is usually safe to assume that thinking about schoolwork is always valuable (short of becoming an exclusive concern) so long as the thinking pays off in terms of improved performance. If further thinking has very little chance of helping a student get a problem right, he would do well to give up.

In many cases, it may be useful to think of two types of search. One type involves active search that excludes other activities, the type that occurs when a person is playing chess. The other type consists more of a postponement of a decision or judgment while other activities are pursued. In the meantime, the thinker remains open to external evidence, or whatever possibilities, evidence, and goals enter the mind spontaneously. That is, the thinker is set to recognize these things as relevant to a problem in the back of her mind and to use them in appropriate ways when they come up. This second kind of search is essentially without cost, except when there is some need to make a judgment or decision before some particular time. Thus, unless there is an explicit reason to stop thinking, there is no good reason to make final judgments and decisions, that are not subject to revision. In this sense, a good thinker is never intolerant of ambiguity or doubt for its own sake, and while she makes judgments and takes actions, she is always open to "new ideas." A good thinker feels no need for certainty for its own sake, only for the purpose of taking action.

Good thinking also involves fairness in the search for evidence and the use of evidence. When we are trying to evaluate some proposition or decision, for example, we should try to think of evidence that goes against the possibility we favor as well as evidence in favor of it. In this way, we make the search for evidence most efficient. If we ignore this rule and look for evidence that favors the possibility we lean towards, we are likely to find such evidence and thereby confirm our choice, but the search for evidence would have been fruitless: we might just as well not have bothered to search at all. In some cases, it pays to search <u>only</u> for negative evidence, as when we are trying to evaluate the truth of a statement that is supposed to be entirely general. When we try to evaluate a statement like, "Right-wing dictatorships <u>never</u> help the poor," the only case that is relevant is a case of one that did.

Likewise, in using evidence to revise the strengths of possibilities (beliefs and tentative actions), we must not ignore evidence that goes against possibilities that are already strong, nor must we ignore evidence that favors possibilities that are weak. One way of seeing what this bias (or its opposite) would mean is to think about the following case. Suppose we are initially neutral between two possibilities (e.g., two computers we are thinking of buying) and we hear something good about one of them, and then something bad about the same one. Suppose that the good and bad thing would cancel each other if we heard them at the same time. But since we hear the good thing first, we raise the strength of the first possibility. Then, when we hear the second thing, we underweigh it because it goes against a possibility we favor. We wind up thinking that this possibility is the better one, although the evidence does not warrant this. This bias, and the bias of searching for evidence that favors a strong possibility, can lead to irrational belief perseverence (see Pitz, 1969, and Lord, Ross, and Lepper, 1979, for possible examples). Once we make up our mind, even tentatively, it is hard to move us.

Biases

There are two reasons to think that biases, or deviations from the optimum range, will tend to be in the direction of thinking too little and favoring current beliefs, rather than the opposite direction. First, the benefits of thinking are mostly in the long-term future, and the costs are immediate. People in general tend to overweigh immediate costs and benefits compared to

long-term ones (see Ainslie, 1975, and Elster, 1979, for interesting discussion). (An exception to this is the kind of thinking done in games. Indeed, people who think a lot, e.g., people who discuss public policy reflectively, may be those who make thinking and discussion into a game rather than those who discipline themselves to keep long-term or moral goals in mind.) Second, if people think too little, they never have a chance to discover what they would have concluded if they had thought more (or whether they would have succeeded instead of given up). However, people who think too much have a chance to discover that the extra thinking does not change the quality of their conclusion or decision - or changes it too little or too infrequently to be worthwhile. (This is not to say that everyone discovers this; there are clearly obsesssive people who do not.)

The same arguments apply to the biases in search for evidence and use of evidence. When evidence is sought and used so as to favor possibilities already strong, thinking is likely to end early, and tentative conclusions are likely to become firm. Thus, these biases would lead to quick conclusions, and be rewarded by escape from the situation in which the thinking started, that is, escape from doubt. (Of course, this is a kind of self deception.) Similarly, a thinker with these biases would not have a chance to discover how different his conclusions might have been if he were less biased. However, a thinker with the opposite biases would find himself constantly wavering back and forth and would thus have a chance to learn that he is biased in the other direction - a chance he may take or not.

Biases that take the form of too little search may have several manifestations, and it is worth pointing out some of these. One is simple impulsiveness as studied in the tradition of Kagan and others (Kagan et al., 1964; Messer, 1976; Baron, Badgio, and Gaskins, in press). Some children, and some adults, appear to give up relatively early, or check too little, in problem solving tasks or tasks involving uncertainty (doubt), so that they go faster than other people but at the expense of more errors. Behaviorally, impulsive children are those who answer questions quickly but incorrectly, who say things they wish they hand't said, and who make careless errors. Impulsive children tend to have difficulty in schoolwork, even when IQ is held constant (Messer, 1976). One consequence of the present framework is that impulsiveness should be evaluated by comparison of the subject's speed to his optimum, and not merely by examination of speed and accuracy alone. Some children who go quickly and make many errors might not be truly impulsive - in the sense of a bias away from the optimum - because they may truly be unable to use the extra time, were they to take it (Baron et al., in press). The present theory suggests three classes of causes of impulsiveness: low subjective efficacy, that is, underestimation of the probability that future thinking will succeed (assuming it has not yet succeeded; see Dweck and Elliott, 1983); overconfidence that the results of the thinking done so far are adequate; and undervaluing the utility of successful thinking compared to its immediate cost. Overconfidence, in turn, may be caused by biased search for evidence or use of evidence so as to favor possibilities already strong, i.e., insufficient self criticism.

Since there are three different search processes, there are three forms of impulsivenss. One form is failing to consider alternative possibilities (or a sifficient number of alternatives) once a single possibility becomes available. Another is failing to check (Baron, 1978) by thinking of additional evidence. A third is not being open to changed goals or subgoals, however consistent with the thinker's ideal long-term plan they might be. This "single

mindedness" is especially harmful in creative tasks or other tasks that are heavily dependent on the "discovery" of goals in the course of the task itself, such as policy making. The discovery of goals is also perhaps one of the activities most crucial for planning itself, especially long-term planning.

The teaching of good thinking

To teach good thinking we must eliminate biases toward too little thinking and insufficient self criticism, which we assume are natural and will develop on their own unless some effort is made to prevent them. There are various ways we might think to do this, but some would seem to be better candidates than others:

Skills, in the narrow sense, are what we teach by providing practice. Improvement of skill does not require doing anything new, but rather increased speed or accuracy at doing the same thing. Although there have been sporadic atttempts to teach thinking by treating as a skill in this sense, the evidence is strongly against the idea that it is possible to put the mind through some sort of conditioning procedure, analogous to what athletes go through when they "get in condition" (Baron, 1984).

Habits, again, in the narrow sense, are behaviors tied to certain situations, indpendent of goals. Habits are useful in thinking to the extent to which the goals will be predictable from the situation. For example, it may be always worthwhile, when doing a certain kind of problem, to check one's initial hunch by looking for other evidence. The teaching of habits as a way of teaching good thinking is limited, however, by our ability to anticipate the situations in which various habits will be acquired.

Facts are taught by telling the student things that we believe to be true. Facts are crucial in expert knowledge, but expertise is not the same as good thinking - which is often practiced by novices. (Expertise often obviates the need for thinking at all.) It is hard to imagine what facts one would teach in order to teach good thinking - as distinct from expertise - except perhaps the facts about thinking itself, as a way of promoting beliefs in its value.

Methods (including "strategies") are objects of instruction that are achieved by telling students how to do something, e.g., the method for long division or the method of multiple hypotheses in science (Chamberlain, 1890/1965). Methods may be useful in specific areas of thinking. One example of a set of methods or strategies consists of those used in reading comprehension of difficult texts, such as those encountered in college. Lytle (1982) has recently developed a system for analysing verbal protocols of the reading of such texts. To generate these protocols, the student thinks aloud at least after reading each sentence of the text. The protocols can be analysed in terms of a framework that can be mapped into the major descriptive categories I presented. For example, when a student does not understand a word, he may think of possibilities for the meaning of the word or search for evidence that will help him think of possibilities or evaluate them. Carol Brown, a graduate student, has recently been looking into how such protocols may be used to diagnose a student's difficulties in reading comprehension. For example, some students, when the recognize a diffculty in comprehension, simply move on and forget about it, without any active thinking. Brown has developed methods to teach such students methods or strategies for overcoming difficulties through thinking, for example, by searching for possibilities and

evidence of certain sorts. Instruction in such methods may do more than teach the methods themselves. It may inculcate in the students a belief that thorough and self-critical thinking can help resolve difficulties - especially if we take pains to teach such a lesson.

Methods will be useful only if there is a belief that they will help and a desire to use them.

Beliefs, as distinct from facts, form a basis of action. The kind of beliefs that might be relevant in the teaching of good thinking are much like religious beliefs, in that they result in a kind of commitment, even though they are not fully justified.

Beliefs may be taught as if they were facts - and are often taught this way - but such teaching is a kind of deception. Otherwise, the teaching of beliefs involves the giving of arguments in favor of the beliefs and rebutting arguments against them. It may also involve demonstrating that one can hold the beliefs, act on them, and be satisfied as a result.

There are many beliefs that make for good thinking, and many that tend to prevent it. Among the former are the beliefs that thinking often leads to better results, that difficultiies can often be overcome through thinking (rather than, say, through luck), that good thinking requires openness to new possibilities and to evidence against favored possibilities, and that there is nothing essentially wrong with being uncertain or undecided. Among the latter are the beliefs that changing one's mind is a sign of weakness, that being open to alternatives leads to confusion and despair, that quick and confident decision-making is a sign of strength or wisdom, that truth is determined by authority, that we cannot influence what happens by trying to understand things and weigh them, and that intuition is the best guide to making decisions. The former beliefs act to oppose the biases we have listed, and the latter act to reinforce them (whatever germ of truth these beliefs might otherwise contain).

An important property of beliefs is that they can be taught in full generality, and - in contrast to the teaching of habits or methods - there is no reason to think they will be any less effective when taught in general than in connection with specific domains of thinking.

It seems likely that the teaching of beliefs of the former sort, and the opposition to beliefs of the latter sort, are important parts of any effort to teach good thinking. Such teaching may be explicit, as when such beliefs are openly discussed and argued, or implicit, as it may be in many programs designed to teach good thinking. An example of the latter is the preschool tutorial program of Blank (1973), in which the tutor, a preschool teacher, uses a specified set of responses to deal with a child's errors in response to a question or request. These responses include: delay, waiting for the child to answer; relating the unknown to the known, or suggesting analogies; and simplification techniques, in which the original question is rephrased to make it answerable by further thinking. One function of these responses seems to be to convince the child that thinking can help. Each type of response puts the child in a situation in which further thinking can be maximally effective - perhaps even more effective than it would be in natural situations. Thus, these techniques may create beliefs that work against the common bias of thinking too little out of low subjective efficacy. (Other techniques involve the giving of counterexamples or the suggestion to think of them, which encourage a self-critical style in the children.)

The importance of beliefs in thinking is consistent with the suggestion of Perkins et al. (1983) that poor thinking often results from a "makes-sense epistemology," in which the thinker believes that the way to evaluate conclusions is by asking whether they "make sense" at first blush. It is also consistent with the claims of Dweck and Elliott (1983) that children's beliefs about the nature of intelligence influence their response to failure in problem solving. According to this view, children who believe that intelligence is a fixed "entity" tend to attribute their failures to their stupidity (or to the difficulty of the task) and thus reduce their effort after a failure. Children who believe that intelligence is a "process," a way of dealing with difficulties, tend to attribute their failures to lack of sufficient effort and thus increase their effort after a failure. Although the latter children - in the extreme - hold a somewhat oversimplified belief, it is one that tends to encourage thinking. Both the belief that error or failure is due to stupidity and the belief that success is due to effort may become self fulfilling in the long run.

The belief that good thinking helps to discover the truth and to make good decisions, and all the associated beleifs of the sort just listed, are useless unless a student has the goal of discovering the truth and making good decisions. Surely, just about everyone wants to do these things (and to be moral) to some extent, but the real issue is the strength of these goals relative to others.

Goals may be taught by deriving them from other goals, by showing the student that the goal in question will help him achieve some goal he already has. Such demonstration can be done in many ways: by argument, by example, or by inducing the student to adopt the new goal (or to increase its strength) as an experiment. It should not be hard to teach the goals associated with good thinking by this method, for good thinking is supposed to help people achieve other rational goals, regardless of what those goals might be. Goals can also be taught by modelling. A student may come to want something because someone he likes or admires wants it. Goals cannot be taught directly by imperative statements: we can tell a person to do something, but it does not make sense to tell him to want something. (Nor can goals be taught as if they were facts, even with deception - in contrast to beliefs.)

Many goals, at many levels of the hierarchy of goals and subgoals, make for good thinking by working against the general biases I have discussed: the goal of thinking well (as something one can take pride in); the goal of knowing the truth, of getting to the bottom of things; the goal of making good decisions; the goal of being reasonable in the sense of being likeable for one's open mindedness and receptivity to the suggestions of others; or the goal of thinking for its own sake, as something that is enjoyable as an activity (socially or alone). Because rational thinking has moral value (Baron, in press, Ch. 6), a person with moral goals, such as being a good citizen, can want to think well as a way of satisfying these goals. This is not a trivial reason to think rationally. It is in the domain of public debate where charges of irrationality are most frequently made, and the desire to avoid such charges may be a powerful goal in those who participate at all.

There are also goals that discourage good thinking: the goal of being steadfast (in sticking to one's conclusions despite counterevidence); the goal of reaching conclusions quickly; the goal of being authoritative (powerful in some sense); and the the goal of honoring authority (despite counterevidence).

Like beliefs, many of the positive goals can very likely be taught (or inculcated) in general, and there is no reason to think they are any less effective this way than when taught specifically. In general, but not always, beliefs and goals come in pairs: people who want to do (or avoid) X tend to believe that it is good to do (or avoid) X. Surely, beliefs and goals affect each other, although much anguish may result from the imperfection of this linkage.

All of the goals I have listed may be affected by culture, and some are very likely entirely due to cultural beliefs about how people ought to run their intellectual lives. Cultures that encourage rational thinking are those that value questionnng, inquiry, the satisfaction of curiosity, and intellectual challenge. Cultures that oppose such thinking are those that value authority, quick decision making, correctness (even from guessing) rather than good thinking, and constancy of opinion to the point of rejecting new evidence. Such values are transmitted in a variety of ways, by expressions of admiration for people who embody them, by the tasks children (and adults) are given to do at home and in school, and so on. Of course, most cultures are not purely positive or negative from this point of view; rather, they teach conflicting beliefs, which lead to conflicting goals.

I have argued (Baron, in press, Chapter 7) that the teaching of thinking is best done at all ages. It may be done in the context of all subject matters, and it is probably best to take full advantage of this possibility, in order to convey the general importance of good thinking in the (ideal) culture. The teaching of thinking may involve the teaching of methods and habits, but it must involve the inculcation of beliefs and goals. This requirement implies that such teaching cannot be divorced from an idological commitment to good thinking among all those who influence the young.

There have been many attempts to teach good thinking (Baron, in press, Ch. 7). Examples include workbooks in creativity or critical thinking (e.g., Noller et al., 1976); Blank's (1973) tutorial method; Papert's (1980) use of computers; Philosophy for Children (Lipman, Sharp, & Oscanyan, 1980); Feuerstein's (1980) instrumental enrichment program; and Whimbey and Lochhead's (1980) pair prblem-solving approach. These methods and others (e.g., Baron et al., in press) have met with apparent success - insofar as it is possible to evaluate them - despite their disparate philosophies and approaches. It is conceivable that any success these programs have had is the result of the inculcation of goals and beliefs, as much as any specific techniques the programs use. To the extent that this is true, the teaching of thinking should be more like the "teaching" of achievement motivation (de Charms, 1976) than the teaching of arithmetic. A minimal requirement for such teaching would seem to be a group of teachers who are commmitted to the values and goals they will try to convey.

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